REVIEW

by Prof. Dr. Vladimir Vassilev Monov

Institute of Information and Communication Technologies

Bulgarian Academy of Sciences

of the materials submitted for participation in the competition

to occupy the academic position of "associate professor"

at Plovdiv University “Paisiy Hilendarski”

in: Field of higher education: *4. "Natural sciences, mathematics and informatics"*

Professional direction: *4.6. "Informatics and Computer Science" (Artificial Intelligence)*

In the competition for "associate professor", announced in the State Gazette, no. 96 of 17.11.2023 and on the website of Plovdiv University "Paisiy Hilendarski" for the needs of the Department of "Computer Systems" at the Faculty of Mathematics and Informatics (FMI), as candidates participate Assistant Professor D-r Asya Todorova Toskova from the FMI of Plovdiv University "P. Hilendarski" and Assistant Professor D-r Veneta Veselinova Tabakova-Komsalova from the FMI of Plovdiv University "P. Hilendarski".

1. General presentation of the received materials

By order No. РД-21-70 dated 16.01.2024 of the Rector of the Plovdiv University "Paisiy Hilendarski" (PU), I have been appointed as a member of the scientific jury of a competition for the academic position of "associate professor" at the PU in the field of higher education 4. "Natural Sciences, Mathematics and Informatics", professional direction 4.6. "Informatics and Computer Sciences" (Artificial Intelligence), announced for the needs of the Department of "Computer Systems" at the Faculty of Mathematics and Informatics. By decision of the Scientific Jury at a meeting , held online in the period 22.01.2024 - 23.01.2024, my participation in the work of the jury was determined by the preparation of a review of the presented materials.

Two candidates have submitted documents for participation in the announced competition:

Assistant Professor D-r Asya Todorova Toskova from the “Computer Systems” Department of the PU "P. Hillendarski”

Assistant Professor D-r Veneta Veselinova Tabakova-Komsalova from the “Computer Systems” Department of the PU "P. Hilendarski".

The set of materials presented to me of Assistant Professor D-r Asya Todorova Toskova is in electronic format and includes the following documents:

1. Application form to the rector for admission to participate in the competition;
2. Curriculum vitae in European format;
3. Diploma for higher education with an acquired educational and qualification degree "master" with an application;
4. Diploma for educational and scientific degree "doctor";
5. List of scientific works;
6. Certificate of compliance with the minimum national and additional faculty requirements;
7. Annotations of the materials under Art. 65. from PRASPU (in Bulgarian and English);
8. Self-assessment of contributions (in Bulgarian and English);
9. Declaration of originality and authenticity of the attached documents;
10. Certificate of work experience;
11. Documents for educational work;
12. Educational textbook;
13. Documents for research work;
14. Scientific works (monograph and copies of publications);
15. Official notes on participation in projects;
16. Evidence of presented reports.

The attached materials of Assistant Professor D-r Asya Todorova Toskova meet the requirements of the ZRASRB, the Rules for its implementation, the respective rules of the ZRASPU and the additional requirements of the FMI of the PU.

The set of materials presented to me of Assistant Professor D-r Veneta Veselinova Tabakova-Komsalova is in electronic format and includes the following documents:

1. Application form to the rector for admission to participate in the competition;
2. Curriculum vitae in European format;
3. Diplomas for higher education with an acquired educational and qualification degree "master" with an application;
4. Diploma for educational and scientific degree "doctor";
5. List of all scientific works;
6. List of works for participation in the competition;
7. Protocol for distribution of authorship on "ARTIFICIAL INTELLIGENCE IN 24" /book one/;
8. Copies of publications;
9. List of citations;
10. List of reviews of scientific works;
11. Certificate of compliance with the minimum national requirements for direction 4.6;
12. Reference for scientific works according to the minimum national requirements for direction 4.6;
13. Certificate of compliance with the additional requirements of the FMI at the PU, according to Art. 65.(3) of the ZRASPU;
14. Annotation of the materials (in Bulgarian and English);
15. Self-assessment of contributions (in Bulgarian and English);
16. Declaration of originality and authenticity of the attached documents;
17. Certificate of work experience;

18. Reference for classroom and out-of-classroom employment;
19. Reference for work with students and graduates;
20. List of published educational materials;
21. Reference for scientific research activity;
22. Reference for work on research and international projects with applications;
23. Certificate of participation in international and national scientific forums;
24. Certificate of membership in an authoritative professional organization in the relevant scientific field;
25. Certificates for presented reports.

The attached materials of Assistant Professor D-r Veneta Veselinova Tabakova-Komsalova meet the requirements of the ŽRASRB, the Rules for its implementation, the relevant rules of the ZRASPU and the additional requirements of the FMI of the PU.

1. Brief biographical data of the candidates

Assistant Professor D-r Asya Todorova Toskova obtained a Master's degree with the qualifications "Physics Teacher" and "Solid State and Optoelectronics Engineer" at the Physics Faculty of PU "Paisiy Hilendarski" in 1991. In 2015, she obtained a Master's degree in "Informatics" at the Faculty of Mathematics and Informatics of the PU. In the period 2014-2020, she worked successively as a part-time assistant, assistant and chief assistant at the "Computer Systems" department of the FMI of the PU. In 2019, the candidate defended a dissertation and obtained the educational and scientific degree "doctor" in the professional direction "Informatics and computer sciences", doctoral program "Informatics". From 2020 to the present, she is the chief assistant at the "Computer Systems" department, where she teaches mandatory courses in the field of software engineering and elective courses in the field of artificial intelligence. Assistant Professor, D-r Asya Toskova, has a teaching experience of 7 years and 7 months, of which 3 years and 9 months as a chief assistant in the Department of Computer Systems. For participation in the competition, 21 scientific works (20 publications and 1 monograph) and 1 educational textbook were submitted, as well as data for 53 citations noticed. The Reference for scientific research shows the candidate's participation in 6 scientific research projects, of which 1 international, 2 university and 3 national scientific projects. Data are presented for 19 reports presented at scientific forums. D-r Asya Toskova is a member of the "John Atanasov" Union of Automation and Informatics.

Assistant Professor D-r Veneta Veselinova Tabakova-Komsalova obtained a master's degree in "Mathematics" and a specialization in "Informatics" at the Faculty of Mathematics and Informatics of PU "Paisiy Hilendarski" in 1999. In 2002, she completed a master's degree in the specialty "Macroeconomics - organization and technology of accounting" at the Faculty of Economics of the University of Plovdiv. In 2018, the candidate defended a dissertation and obtained the educational and scientific degree "doctor" in professional direction 1.3 "Pedagogy of training",

doctoral program "Methodology of training in informatics and information technologies". In the period 1999-2011, D-r Veneta Tabakova-Komsalova worked as a teacher of informatics and information technologies in the PG on PSTT, and from 2011 to 2020 she held the position of senior expert and head of the APFSIO department at the Regional Department of Education , Plovdiv. From 2020 to the present, she is the chief assistant at the Computer Systems Department of the Faculty of Mathematics and Informatics of the PU, where she teaches mandatory courses in artificial intelligence and databases, as well as elective courses in the field of artificial intelligence. Assistant Professor D-r Veneta Tabakova-Komsalova has 14 years and 7 months of teaching experience, of which 3 years and 2 months as the chief assistant at the Department of Computer Systems at the FMI of the PU. For participation in the competition, 48 scientific works (45 publications, 2 monographs and 1 book) and 1 educational textbook were submitted, as well as data for 53 citations noticed. The Reference for scientific research activity shows the candidate's participation in 20 international conferences abroad, 3 international conferences in Bulgaria, 5 national conferences with international participation and 6 national conferences. Data on participation in 8 scientific research projects are presented, of which 1 international, 2 national, 2 national scientific programs and 3 university projects. A list of reviews of scientific works prepared by the candidate is attached. D-r. Veneta Tabakova-Komsalova is a member of the "John Atanasov" Union of Automation and Informatics.

The presented biographical data show that both candidates have the necessary scientific, teaching and professional experience, which is required for participation in the announced competition for the academic position of "associate professor" at PU Paisiy Hilendarski".

2. General characteristics of the candidates' activities

2.1. Assistant Professor D-r Asya Todorova Toskova

Educational and pedagogical activity

Teaching activity. D-r Asya Toskova led exercises in the mandatory disciplines "Software Technologies" and "Practicum in Software Technologies" at the "Computer Systems" department, as well as exercises in the disciplines "Introduction to Software Engineering" and "Java Programming". She also taught lectures on "Software Technologies" to second-year full-time and part-time students in specialty "Software Technologies and Design". She has developed and led courses in elective disciplines "Cognitive Robotics" and "Machine Learning". The attached Report for teaching activity shows that the applicant's teaching workload exceeds the norm for the annual horary of 360 hours.

Teaching aids. For participation in the competition, an educational textbook "UML modeling - software success planning" by author Asya Toskova, publishing house of PU "Paisiy Hilendarski", 2023, 106 pages, is presented. The textbook covers the basic principles and tools of the UML (Uni-

fied Modeling Language) language for modeling object-oriented software systems. Numerous examples and exercises are included for visualizing and perceiving the content. The textbook contains valuable and useful material mainly for students studying various specialties in the field of software engineering, but in essence it **does not fully correspond** to the theme of the competition (artificial intelligence).

Preparation of graduates. D-r Asya Toskova has 1 defended graduate in 2022. In the period 2016-2023, reviews of bachelor's and master's theses were prepared and she had participation in state and candidate student examination committees.

Scientific and scientific-applied activity

Assistant Professor D-r Asya Toskova has submitted 21 scientific works for participation in the competition, which do not repeat the works for obtaining the educational and scientific degree "doctor" and the academic position "chief assistant". Three of the works are self-authored, the remaining 18 are co-authored. A self-authored monograph, in English, published by publishing house "Prof. Marin Drinov" of BAS in 2023 is presented. 13 of the publications are in issues that are referenced and indexed in WoS and/or Scopus databases, of which 1 publication is in issue with impact factor (IF) and 3 in releases with SJR rank.

When reporting the scientific and scientific-applied activity, the candidate made the **following inaccuracy.** In the presented list of works, publications [9,10,11, 12] that were issued in the proceedings of the International Conference on Intelligent Systems are marked as publications with SJR rank, which is not correct. Proceedings of this conference are referenced in Scopus but do not have an SJR rank. The same publications were incorrectly scored with 30 points in indicator group D of the Reference with minimum national requirements. The correct score for each of these publications is 18 points.

In the attached Report of research activity, D-r. Asya Toskova stated that she participated in the competition with 28 publications, noting that the presented monograph in a foreign language equates to 6 publications, and the book chapter to 3 publications. However, in the same reference, the book chapter is again listed as being equal to 1 publication with an impact factor (IF), in which case I consider that **the reference is not prepared precisely enough**. Regarding the equating of 1 monograph to 6 publications, I think that the applicant can count his work either as a monograph or as 6 publications, but not both at the same time. The same applies to equating the chapter of a book in a foreign language. Since the Reference for scientific research activity is made unclear, I assume that the works for participation in the competition are 21, of which one monograph, one chapter of a book in a foreign language and one publication in a journal with IF (Comptes rendus de l'Acade' mie bulgare des Sciences).

Contributions. The contributions in the works of Ch. Assoc. Dr. Asya Toskova have a scientific and scientific-applied nature and relate mainly to the field of machine learning. In the monograph "Some Studies in Machine Learning - Computer Vision & Recommendation", [1] computer vision modules designed to solve specific problems of intelligent recognition are developed and tested. The individual modules are described in detail, their principles of operation and implementation possibilities using various machine learning techniques are discussed. The theoretical foundations of the methods used are presented. The developed modules and machine learning techniques are applied in three directions.

- *Detection of weeds in wheat.* A module was developed for recognition of weeds in wheat fields using a convolutional neural network (Convolutional Neural Network), implemented in Python. A Wheat-Weed Dataset of 4647 images of weeds and wheat was created to train the network and it is freely available for research and practical purposes. The results are presented in publications [2,3,8,9] from the list of scientific works.

- *Recognition of Bulgarian embroidery.* A method has been developed for recognition of Bulgarian embroidery using an intelligent multi-agent system. The task of recognizing the embroidery is divided into three separate parts – recognition of the image as embroidery, determination of the embroidery as Bulgarian and its classification to the relevant field of production. The results are presented in publications [10,15].

- *Recommending serious games to children with special educational needs.* A module was created to recognize user preferences and recommend personalized resources in a game-based learning platform designed for students with special educational needs. The module uses a recommending system and a Bayesian classifier to train the recommending system implemented in Java. The development provides a personalized and engaging learning experience for children with different needs. The results are presented in publications [4,13].

Contributions in works with numbers [5,6,7,11,12,14,16,17,18,19,20,21] from the list of scientific works **are not included** in the attached Self-assessment of the candidate's contributions. These works contain results in the following main directions:

- *Intelligent sensor networks.* Publications [5,11,14,17,19].

- *Robotics.* Publications [16,18,21].

- *Development of intelligent assistants in various fields.* Publications [7,12,20].

Papers with numbers [5,6,7,11,12,14,16,17,19,20,21] from the list of scientific works are co-authored and the lack of self-assessment of the contributions in them **does not make it possible** to assess the personal contribution of the candidate in these works.

Citations. In the Reference for research activity, D-r Asya Toskova has presented a list of 53 citations, of which 27 are in prestigious publications, indexed and referenced in the scientific information databases WoS and/or Scopus. The noted citations are in the works of both our and foreign authors. With this, significant results in the scientific-research activity of the candidate have obviously aroused interest and received recognition among the scientific community at home and abroad.

Other indicators of scientific and scientific-applied activity. D-r Asya Toskova presented data on participation in 3 national scientific programs, 2 university projects and 1 international scientific project. She has presented 19 reports at international conferences and national scientific forums.

2.2. Assistant Professor D-r Veneta Veselinova Tabakova-Komsalova

Educational and pedagogical activity

Teaching activity. D-r Veneta Tabakova-Komsalova has developed and led exercises on the mandatory disciplines "Artificial Intelligence", "Intelligent Systems" and "Databases" at the Department of "Computer Systems" for bachelors in the specialties "Informatics", "Business Information Technologies", "Software Technology and Design", "Software Engineering". In addition to the mandatory courses, she teaches an additional course "Introduction to Artificial Intelligence and Prolog Logic Programming" for the specialties"Business Information Technologies", "Software Technologies and Design", "Business Mathematics" and "Information Technologies, Mathematics and Educational Management" at FMI of PU. In the master's program "Software technologies with specialization in artificial intelligence systems" she teaches disciplines "Databases" (60 hours of lectures and 30 hours of exercises) and "Artificial intelligence" (30 hours of exercises). D-r Veneta Tabakova-Komsalova participates in the development of new lecture courses, exercises and systems of tests and tasks to control students' knowledge. The attached Reference for teaching activity shows active classroom and extracurricular work with which the applicant's educational activity exceeds the annual norm of 360 hours.

Teaching aids. For participation in the competition, a 143-page educational textbook "Artificial Intelligence Guide" published by the publishing house of PU "Paisiy Hilendarski" in 2022 was submitted. The textbook was co-authored by three authors, where the candidate is in the first place, but the participation of each of them is **not particularly specified**. The textbook presents the capabilities of the Prolog language and the classic search methods in artificial intelligence. The educational textbook was developed in accordance with the requirements and the curriculum on artificial intelligence at the Faculty of Mathematics and Informatics of PU "Paisiy Hilendarski" and its content corresponds to the theme of the competition.

Preparation of graduates. D-r Veneta Tabakova-Komsalova has 3 defended graduates in the period 2020-2022. In 2024, she supervises 2 more graduates. She has prepared reviews of bachelor's and master's theses.

Scientific and scientific-applied activity

Assistant Professor D-r Veneta Tabakova-Komsalova has submitted 48 scientific works for participation in the competition, which do not repeat the works for obtaining the educational and scientific degree “doctor” and the academic position “chief assistant”. Two of the works are self-authored, the remaining 46 are co-authored. The list of scientific works includes 1 book, 2 monographs, 15 journal publications, 28 conference publications and 2 book chapters. 19 of the publications are in issues that are referenced and indexed in the WoS and/or Scopus databases, of which 1 publication is in issue with impact factor (IF) and 3 in issues with an SJR rank. A list of 6 publications reviewed by the candidate for international journals is also presented.

Contributions. The contributions in the works of Assistant Professor D-r Veneta Tabakova-Komsalova have a scientific and scientific-applied nature and refer to three main directions.

- *Artificial intelligence systems.* The main contributions in this direction are contained in the self-authored monograph [3.3] "Presentation of knowledge in systems with artificial intelligence" in a volume of 149 pages, published by the Publishing House PU "Paisiy Hilendarski" in 2024 and the co-authored monograph [3.1] " Artificial Intelligence in 24" in a volume of 287 pages, published by the Publishing House "Prof. Marin Drinov" of BAS in 2023. The book has three authors, a separation protocol is presented, in which 40% participation of the candidate is reported. In the mentioned works, basic topics in artificial intelligence are considered, such as solving problems with search methods, as well as the main forms of knowledge representation and information processing using logic and logic programming languages. Author contributions in this direction are also contained in the publications [1.14, 2.1, 2,2, 2.24].

- *Introduction of artificial intelligence in secondary school.* In the book [3.2] from the list of scientific works, problems related to the formation and development of algorithmic thinking as a basis for the introduction of artificial intelligence in school education are considered. Contributions of the candidate in this direction are also contained in a number of publications [1.1, 1.2, 1.3, 1.7, 1.8, 1.9, 1.10, 1.15, 1.23, 2.3, 2.8, 2.13, 2.14, 2.25] presenting results related to artificial intelligence training in secondary school, learning Prolog and logic programming, developing innovative teaching approaches, analyzing and evaluating results. The application of digital libraries, ontologies and structured databases in education is presented in [1.4]. Papers [1.6, 1.13] examine the introduction of artificial intelligence through school STEM centers. Publications [1.11, 2.12, 2.29, 2.30] contain candidate-developed AI training programs.

- *Application of artificial intelligence in smart agriculture.* The contributions of D-r Veneta Tabakova-Komsalova in this direction are related to the development of a software platform for intelligent agriculture ZEMELA [1.5, 2.18] and the main components integrated into it, such as a personal assistant [2.4, 2.19], an event model, a database and knowledge base [2.11, 2.15, 2.16, 2.21, 2.22], environment for modeling the processes in intelligent agriculture [2.17, 2.20]. Opportunities for using large language models in the ZEMELA platform are outlined in [2.27]. Publications [2.5, 2.9, 2.26] present the development of a diagnostic expert system in the field of intelligent animal husbandry.

Citations. The list of noticed citations of the candidate's works contains data for 53 citations, of which 27 are in prestigious publications, indexed and referenced in the scientific information databases WoS and/or Scopus. Authors of the citing works are both our and foreign scientists. The noted citations indicate that the candidate's works have generated interest and received recognition in the scientific community.

Other indicators of scientific and scientific-applied activity. D-r Veneta Tabakova-Komsalova has presented data on participation in 1 international scientific project, 2 national scientific programs, 3 university projects and 2 projects for the "Scientific Research" fund of the Ministry of Education and Culture, one of which she is the head of. She has presented 18 reports at international conferences and national scientific forums.

3. Summary assessment of candidates

Data on the fulfillment by the two candidates of the minimum national requirements, additional faculty requirements of FMI and other indicators of scientific and scientific-applied activity are presented in Tables 1, 2 and 3.

Table 1. Minimum national requirements

Indicator	Minimum number of points	Assistant Professor D-r Asya Todorova Toskova	Assistant Professor D-r Veneta Veselinova Tabakova-Komsalova
Group A	50	50	50
Group B	100	100	200
Group Г	200	297*	497
Group Д	50	212	216
Group E	-	70	77
Total points	400	729	1040

*Remark. The points indicated by the candidate are 345, but they have been corrected to 345-48=297, due to incorrectly reported publications [9,10,11, 12] which are in issues without SJR rank.

Table 2. Additional faculty requirements of FMI			
Indicator	Minimal requirements	Assistant Professor D-r Asya Todorova Toskova	Assistant Professor D-r Veneta Veselinova Tabakova-Komsalova
Publications	10 бр.	21	48
Publications in journals	5 бр.	7	15
Citations	5 бр.	53	53*
Educational aids	1 бр.	1	1

*Remark. The number of citations indicated by the candidate in the Reference for additional faculty requirements is 48, but in the List of noticed citations additional data are given for a total of 53 citations.

Table 3. Other indicators of scientific and scientific-applied activity		
Indicator	Assistant Professor D-r Asya Todorova Toskova	Assistant Professor D-r Veneta Veselinova Tabakova-Komsalova
Monographs	1	2
Books and book chapters	1	3
Publications in WoS and/or Scopus	13	19
Publications with IF	1 бр., IF: 0.343; Q3	1 бр., IF: 2,4; Q1
Cited in WoS and/or Scopus	27	27
Foreign and international editions	14	25
Bulgarian editions	8	23
Self-authored works	3	2
Presented reports	19	18
Participation in projects	6	8

The data in Tables 1 and 2 show that both candidates meet and exceed the minimum national requirements and additional faculty requirements of the FMI for the academic position of Associate Professor. The scientific metrics of the candidate Assistant Professor D-r Veneta Veselinova Tabakova-Komsalova according to the indicators from Table 1 and most of the indicators in Table 3 **exceed** those of the candidate Assistant Professor D-r Asya Todorova Toskova.

The scientific research activity of Assistant Professor D-r Asya Todorova Toskova is represented in a **sufficient** number of works, which contain original scientific and scientific-applied contributions in the field of machine learning and its application in image recognition methods. However, 11 of her works, which are co-authored, are not included in the attached Reference for self-assessment of contributions, which does not make it possible to assess her personal contribution in these works. The educational and pedagogical activity of Dr. Asya Toskova is active, as the mandatory disciplines led by her, as well as the prepared study aids, are mainly in the field of software technologies. As a thematic orientation, this activity of the candidate **does not fully correspond** to the theme of the competition (artificial intelligence). Assistant Professor D-r Asya Todorova Toskova has 1 defended graduate.

The scientific research activity of Assistant Professor D-r Veneta Veselinova Tabakova-Komsalova is represented in a **significant** number of works, which contain original scientific and scientific-applied contributions in the field of artificial intelligence systems, artificial intelligence training and its application in intelligent agriculture. D-r Veneta Tabakova-Komsalova's educational and pedagogical work is active and includes courses from the mandatory disciplines of artificial intelligence and intelligent systems, as well as courses on databases and logic programming in Prolog. The developed educational textbook “Artificial Intelligence Guide" is in accordance with the requirements and the curriculum on artificial intelligence at FMI. The scientific-research and teaching-pedagogical activity of the candidate **fully correspond** to the theme of the competition (artificial ntelligence). Assistant Professor D-r Veneta Veselinova Tabakova-Komsalova has 3 defended graduates.

The scientific works and documents submitted for participation in the competition show the active participation and personal contribution of the candidates in the scientific research work and educational and pedagogical activity. For the most part, the publications of both candidates are co-authored, which shows an established experience of working in a team. Both candidates have participation in national, international and university projects, where such experience is undoubtedly needed. At the same time, the small number of self-authored works (Table 3) gives me grounds to recommend to both candidates in their future activity to prepare and publish more independent publications in editions that are visible in the world databases of scientific information.

CONCLUSION

The documents and materials of the two candidates submitted for the competition meet all the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for its implementation and the respective Regulations of the PU "Paisiy Hilendarski" for occupying the academic position of "associate professor".

Given the overall volume, content and contributions of the candidates' works, their teaching and pedagogic activity and scientific metrics, as well as in view of the degree of correspondence of the results presented by them with the thematic area of the announced competition, I find it reasonable to offer to the esteemed Scientific Jury to prepare a report to the Faculty Council of the Faculty of Mathematics and Informatics for the election of **Assistant Professor D-r Veneta Veselinova Tabakova-Komsalova** on the academic position of "associate professor" at PU "Paisiy Hilendarski" in the field of higher education 4. "Natural sciences, mathematics and informatics", professional direction 4.6. "Informatics and Computer Science" (Artificial Intelligence).

03/02/2024 Reviewer:

Sofia /Prof. D-r Vladimir Monov/